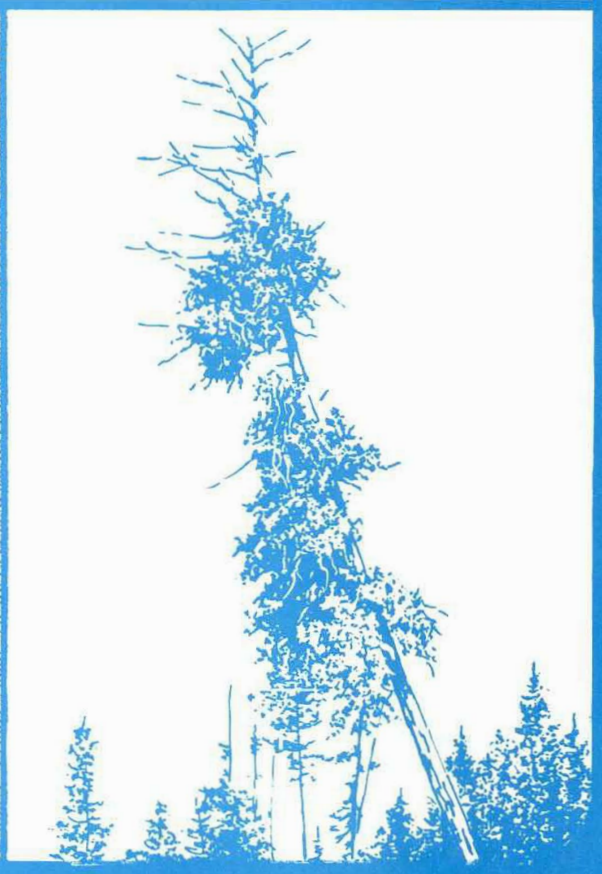
R. L James.

76-01

Forest Insect & Disease Conditions-1975



FOREST ENVIRONMENTAL PROTECTION

USDA - FOREST SERVICE - NORTHERN REGION
State and Private Forestry
Missoula, Mt. 59801

REPORT 76-01
MARCH, 1976

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FOREST INSECT AND DISEASE CONDITIONS

1975

by

Scott Tunnock and Oscar J. Dooling

STATUS OF FOREST INSECTS

Conditions in Brief

Several major forest insect pests continued to deplete forest resources in the Northern Region in 1975. Western spruce budworm defoliated firs and spruce on almost 4 million acres in Montana, Idaho, and Wyoming. Pilot control tests involving two chemical insecticides and a microbial agent were tested against the budworm in eastern Montana. Douglas-fir tussock moth damage was only found in Coeur d'Alene, Idaho, and in two small spots totaling 26 acres in western Montana. Larch casebearer defoliation was heavy on 23,734 acres in the Idaho Panhandle and Clearwater National Forests, Idaho, and Kootenai National Forest, Montana. The pine needle sheath miner lightly defoliated lodgepole pine on 21,627 acres in Montana and Idaho.

Mountain pine beetle is epidemic in lodgepole pine stands in the Lolo, Kootenai, Beaverhead, and Gallatin National Forests, and Glacier National Park in Montana, and Yellowstone National Park in Wyoming. Second-growth ponderosa pine stands are heavily infested on the Lolo, Bitterroot, Helena, and Lewis and Clark National Forests, and on the Crow Indian Reservation in Montana. Chronic infestations persist in old-growth white pine stands in Idaho and Montana.

Few groups of Douglas-fir beetle killed trees were detected in 1975. Pine engraver beetles were active on the Lolo National Forest and Flathead Indian Reservation in Montana. Fir engraver beetle damage is widespread and heavy over most of northern Idaho and western Montana where grand fir grows. The western balsam bark beetle remains a chronic killer of subalpine fir in the Region. Western pine beetle damage to mature ponderosa pine increased on the Nezperce National Forest, Idaho.

The forest tent caterpillar defoliated hardwoods near Evaro and Libby, Montana. Western false hemlock looper infestations collapsed.

Major Defoliators

WESTERN SPRUCE BUDWORM, *Choristoneura occidentalis* Freeman. Visible defoliation extended over 3,898,981 acres of the Northern Region (Fig. 1) during 1975, exclusive of the Nezperce National Forest, Idaho. Although data is incomplete for the Nezperce which had over a million acres defoliated in 1974, in general, the budworm population has decreased dramatically over most of this Forest.

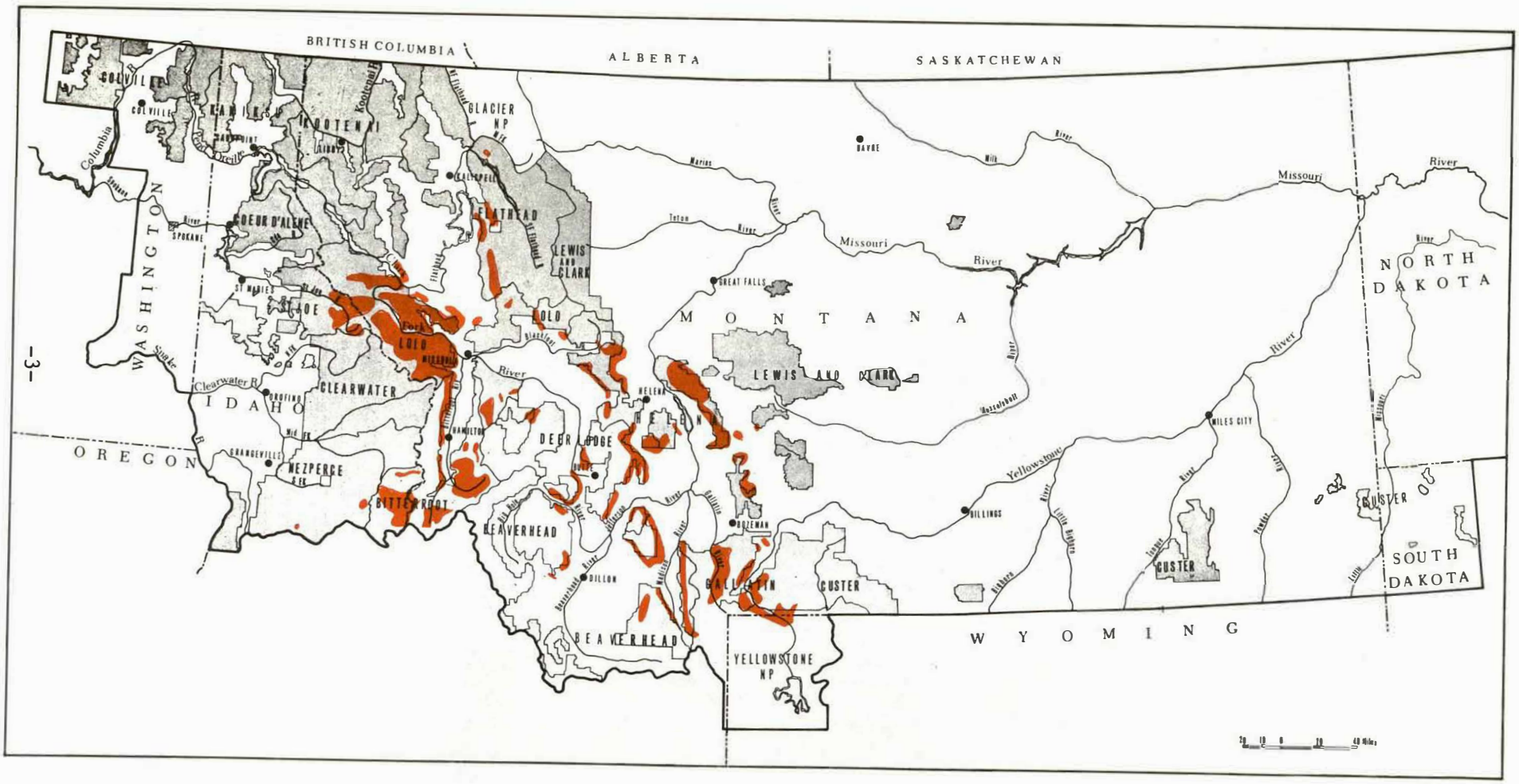
Table 1 shows defoliation increased in 1975 on eight National Forests, Yellowstone National Park, and the Flathead Indian Reservation. Decreases occurred on Idaho Panhandle, Nezperce, Lewis and Clark, and Lolo National Forests.

Table 1.--Acres of aerially visible western spruce budworm defoliation, Region 1, 1973-75

Unit	Defoliation (acres) 1973	1974	1975
Idaho			
Clearwater National Forest	414,680	591,479	634,830
Idaho Panhandle National Forests	146,000	204,841	189,617
Nezperce National Forest	1,321,000	1,182,823	7,040 a/
Subtotal	1,881,680	1,979,143	831,487
Montana			
Beaverhead National Forest	14,500	48,770	240,990
Bitterroot National Forest	347,000	262,998	402,504
Deerlodge National Forest	78,320	268,237	271,629
Flathead Indian Reservation	119,560	104,679	105,705
Flathead National Forest	120,090	110,873	111,219
Gallatin National Forest	11,400	54,026	337,929
Helena National Forest	44,680	259,752	473,937
Kootenai National Forest	0	0	3,606
Lewis and Clark National Forest	350	18,534	7,367
Lolo National Forest	931,000	1,033,440	1,000,600
Subtotal	1,666,900	2,161,309	2,955,522
Wyoming			
Yellowstone National Park	17,280	39,933	111,972
Grand total	3,565,860	4,180,385	3,898,981

a/ Entire Nezperce National Forest was not surveyed for western spruce budworm.

Figure 1.--Areas of western spruce budworm infestation, Northern Region, 1975



Pilot tests (Fig. 2) were conducted in Montana using two insecticides, Sevin 4-Oil (carbaryl) and Dylox (trichlorfon), and a bacterial insecticide, Dipel (*Bacillus thuringiensis* Berliner). Each material was aerially sprayed on three 1,100-acre plots. Sevin and Dylox were applied on the Beaverhead National Forest, and Dipel was applied on the Gallatin National Forest. Sevin was applied at the rate of 1 pound in one-half gallon of oil per acre and gave an average of 81.8 percent control. Dylox averaged 76.8 percent control at 1 pound in 1 gallon of carrier per acre. Dipel at 1 pound in 2 gallons of water per acre killed an average of 50.4 percent of the budworm larvae.

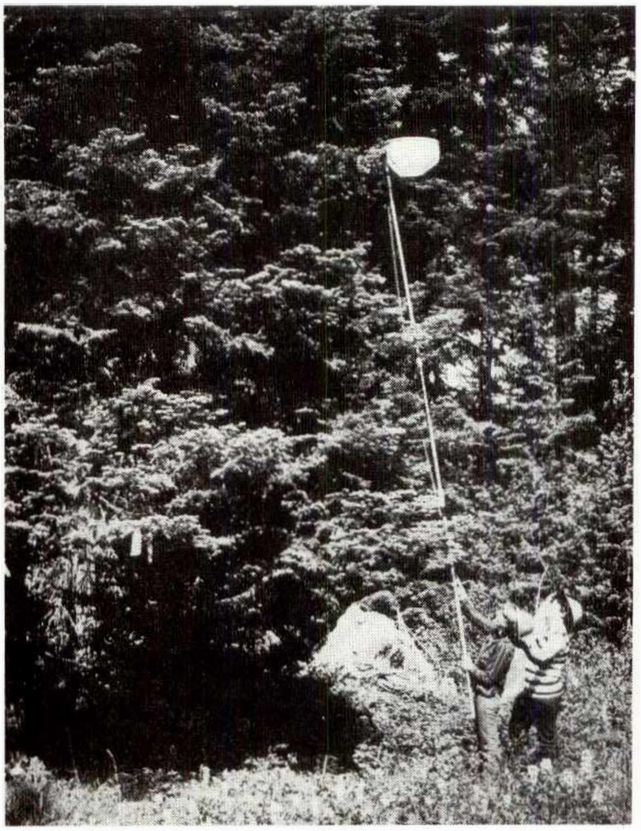


Figure 2.--Crew sampling branches for western spruce budworm larvae during pilot control project.

A fall egg mass survey was made on the Beaverhead, Deerlodge, Flathead, Gallatin, Helena, and Lolo National Forests in Montana. Defoliation is predicted to occur at about the same intensity in 1976 as in 1975 east of the Continental Divide, but the number of acres infested is expected to increase. In western Montana and northern Idaho, infestations should remain static or decrease in 1976.

DOUGLAS-FIR TUSSOCK MOTH, *Orgyia pseudotsugata* McDonald. The 1974 epidemic in northern Idaho collapsed by the end of the season due to spraying with DDT, parasitism, predation, and disease. No defoliation was visible from the air in 1975. However, in the city of Coeur d'Alene,

several ornamental trees contained larvae. Traps baited with female Douglas-fir tussock moth sex pheromone were placed on 323 plots throughout northern Idaho from the Canadian border to Riggins. Tussock moths were caught in all areas baited, but not on every plot. Pheromone traps show promise as a survey tool for detecting future population buildups.

In Montana, defoliation was detected on 10 acres of Douglas-fir near Missoula and 16 acres on the Flathead Indian Reservation where populations were present in 1974. The infestation near Flathead Lake was monitored during 1975 to determine the degree of mortality. Parasites killed 7.7 percent of the population; nucleopolyhedral virus killed 48.6 percent; and unknown factors killed 43.4 percent. Fall egg mass surveys indicate negligible defoliation will occur in this area in 1976.

Pheromone traps were set out in 125 plots in Montana of which 69 attracted tussock moths. Moths were found in west central Montana, from Whitefish south to Darby, but were not collected east of the Continental Divide.

The impact of 1 year of severe defoliation was determined within Douglas-fir stands on the Nezperce National Forest in Idaho. Results showed most defoliated trees suffered a 30 percent reduction in radial growth for 2 years following defoliation.

LARCH CASEBEARER, *Coleophora laricella* (Hbn.). Heavy defoliation occurred on 20,000 acres on the Panhandle National Forest, Idaho; 3,000 acres on the Clearwater National Forest, Idaho; and 1,000 acres on the Kootenai National Forest, Montana, in 1975. Light infestations occur throughout the larch type of the Northern Region.

Efforts to control the larch casebearer have centered around the introduction of parasitic wasps. For several years, new species of parasites have been released within larch stands near Evaro, Montana. In 1975, 401 *Elachertus argissa* (Walker) and 365 *Necremmus metalarus* (Walker) were liberated in this area. Success of establishment of these releases will be determined in 1976.

PINE NEEDLE SHEATH MINER, *Zelleria haimbachi* (Busch). Infestations and noticeable defoliation decreased during 1975 in the Northern Region. Approximately 2,956 acres of lodgepole pine were lightly defoliated on the Flathead National Forest and near Lake McDonald inside Glacier Park in Montana, and visible defoliation was detected on the east half of the Lolo National Forest in Montana. Defoliation was detected on 300 acres on the Powell District of the Clearwater National Forest in Idaho.

Major Bark Beetles

MOUNTAIN PINE BEETLE, *Dendroctonus ponderosae* Hopk. Mountain pine beetle continued to decimate lodgepole, ponderosa, and white pine stands in the Northern Region (Fig. 3) in 1975.

Infestations in lodgepole pine: Approximately 118,486 lodgepole pine were killed, including 5,666,400 board feet on U.S. Forest Service, Burlington Northern, and U.S. Plywood lands in the Lazier and Meadow Creek drainages of the Lolo National Forest in Montana from 1972 to 1974. New epicenters, ranging from three to 100 trees/group were detected throughout the Thompson River drainage on Federal, State, and private lands. Epidemic infestations developed near old epicenters on Federal, State, and private lands near St. Regis and Superior, Montana. Infestations are expected to intensify in 1976.

The infestation increased in the Upper Yaak River drainage of the Kootenai National Forest in Montana. In excess of 75,000 trees were infested in 1975. Hot spots were in Solo Joe, Caribou, Basin, and Vinal Creeks and West Fork Yaak River drainages. Continued heavy losses are expected in 1976. Accelerated salvage logging is planned to remove susceptible trees to convert susceptible stands to younger age classes to alleviate losses.

An outbreak which started in 1974 in Jack Creek east of Ennis on the Beaverhead National Forest in Montana spread considerably in 1975. About 10,000 trees were killed on 2,750 acres of Burlington Northern and 2,800 acres of Forest lands. Approximately 400 trees were killed along Cliff Lake and Hidden Lake benches.

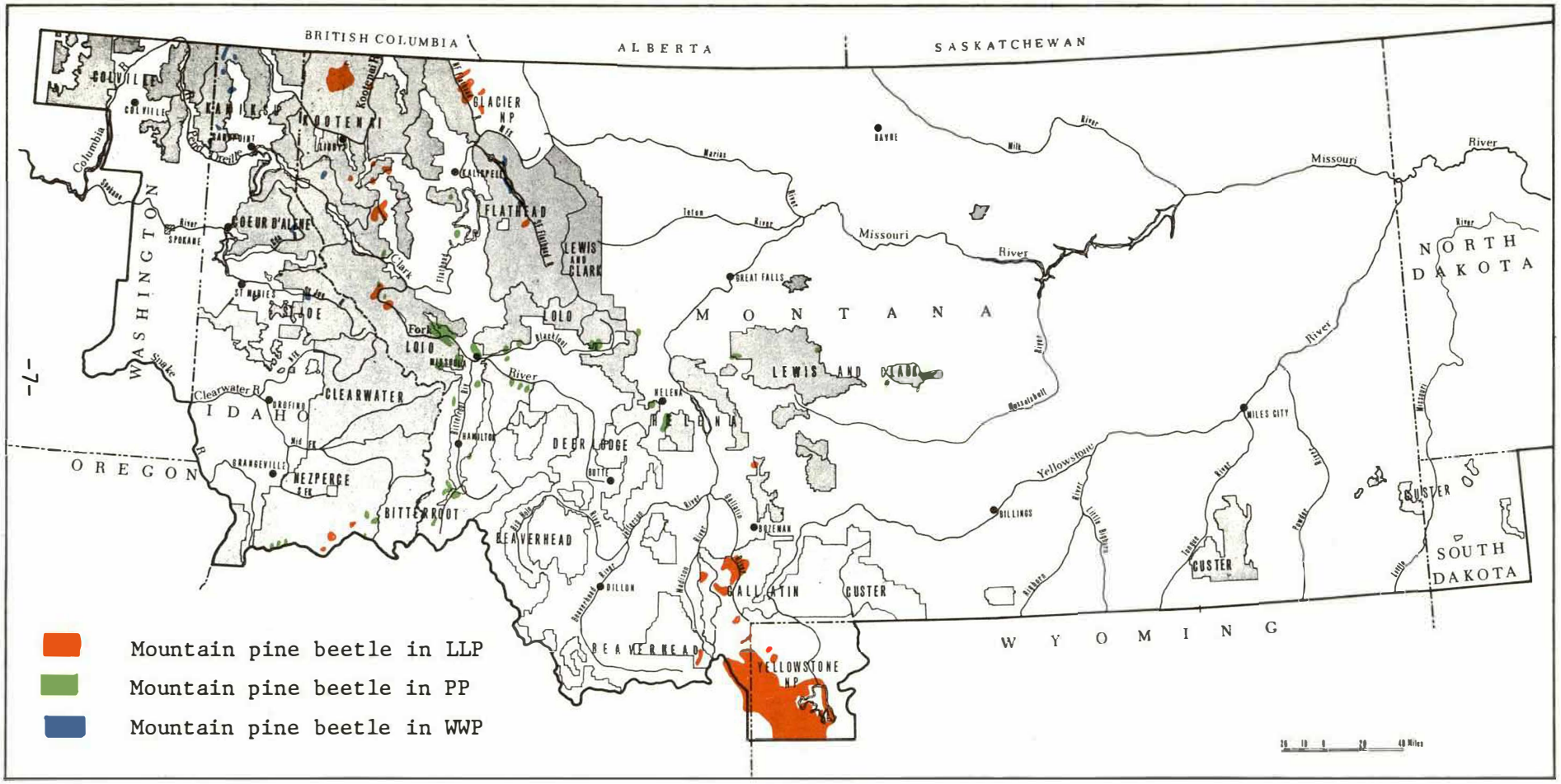
Infestations intensified on the Gallatin and Hebgen Lake Ranger Districts of the Gallatin National Forest in Montana. Trees on approximately 113,704 acres are infested on these two Districts. Surveys show an average of 56 infested trees/acre, with a volume loss of 23,555,860 board feet in the past 3 years. Tree mortality is expected to continue at a high level with many new outbreak centers developing in 1976.

The Yellowstone National Park epidemic increased from 275,200 acres in 1974 to 692,228 acres in 1975. Infested trees occur from Teton National Park, north around Yellowstone Lake, and northwest of West Yellowstone to the Gallatin National Forest boundary.

Groups of dying trees are scattered from Dutch Creek northwest to Kintla Lake on the west side of Glacier National Park, Montana. Epicenters occur in Logging, Quartz, and Bowman Creek drainages and on the southeast slopes of Kintla Lake. Over 8,500 acres are infested in the above areas. Infestations are expected to enlarge with increased tree mortality in 1976.

Infested groups of from five to 200 trees are scattered throughout the Pleasant Valley complex on State and private lands within the boundaries of the Fisher River Ranger District, Kootenai National Forest, Montana.

Figure 3.--Areas of mountain pine beetle infestation, Northern Region, 1975



Infestations in ponderosa pine: More than 5,000 dead trees were detected from Evaro, Montana, west and up Ninemile Creek drainage in second-growth ponderosa pine on the Ninemile Ranger District, Lolo National Forest, Montana. Thinning operations are continuing on the Ninemile Ranger District to reduce the infestation. There was a concentration of about 300 attacked trees on private lands along Lolo Creek drainage near Smith Creek. There are five groups of five to 15 trees near the mouth of Quartz Creek near Tarkio. Around and north of Thompson Falls, seven groups of five to 20 trees were killed. North of Missoula, up the Rattlesnake Creek drainage, about 350 pines were attacked, and groups containing from five to 75 dead trees were scattered on both sides of the Clark Fork River from Missoula east to Bearmouth.

The Bitterroot Valley in Montana contained widely scattered infestations on private lands. Greatest tree mortality occurred on the south-facing slopes of Eightmile Creek--about 500 trees were killed. Attacked trees were also detected in Larry, Brooks, Threemile, Silverhorn, Spoon, and Spade Creek drainages. The West Fork Ranger District only had 150 scattered dead trees and there were about 350 dead trees on the Magruder District, Bitterroot National Forest, Montana.

More than 400 trees were killed southwest of Helena, Montana, in Grizzly, Squaw, and Orofino Gulches. Four groups, totaling about 70 trees, were attacked east of Marysville on private land. Over 600 second-growth ponderosa pine were killed from Lincoln Gulch east to Keep Cool Creek, Lincoln Ranger District, Helena National Forest, Montana.

Approximately 1,200 trees were killed on the lower half of Tenderfoot Creek drainage, White Sulphur Springs District, Lewis and Clark National Forest, Montana, and on private lands in Blacktail and Spring Creek drainages. Heavy tree kill was mainly on private lands south and east of the Big Snowy Mountains and within and northwest of the Little Snowy Mountains. These infestations have been active since the 1960's and thousands of second-growth trees are killed yearly. Small, scattered group attacks occurred on Monarch Mountain, Belt Creek District, and within Sage and Yogo Creek drainages, Stanford District, Lewis and Clark National Forest, Montana.

Infestations have been increasing for 3 years on Crow Indian Reservation lands and in adjacent private lands south of Lodge Grass, Montana. Epicenters occur in the heads of Indian and North Fork Rosebud Creek drainages. These infestations are expected to continue at epidemic levels in 1976.

Infestations in western white pine: On the Idaho Panhandle National Forests a few small groups, ranging in size from one to five trees, of mature pine were still killed within the Lightning Creek drainage, which was heavily salvage logged several years ago. On the Bonners Ferry District, small groups extend in most major drainages from Caribou Creek north to Blue Joe Creek. Groups of one to eight trees are prevalent in Binarch, Tango, and Beaver Creek drainages and from Gold Creek

north to the Canadian border on the Priest Lake District. Salvage continued in Yellow Dog and Downey Creek drainages on the Wallace District and also in white pine stands on the Fernan District. Salvage logging reduced infestations to endemic levels on the Red Ives District.

Few small groups occur in Skull and Quartz Creek drainages on the Canyon District, Clearwater National Forest, Idaho.

In Montana, chronic killing continues in pockets of mature white pine around the shores of Hungry Horse Reservoir, Flathead National Forest. On the Kootenai National Forest, Montana, there are 150 killed trees in the East and North Forks Bull River on the Cabinet District.

DOUGLAS-FIR BEETLE, *Dendroctonus pseudotsugae* Hopkins. Remnants of an epidemic of this beetle that lasted from 1971 to 1973 within the North Fork Clearwater River drainage in Idaho were evident in 1975. Groups of red-topped trees ranging from two to 20 trees per group were scattered from Reeds Creek on the southeast side of the river to Canyon Ranger Station. This only amounted to about 340 trees in this area which was mainly State and private land. On the Clearwater National Forest, Idaho, some activity was detected in Skull, Quartz, Rock, Cold Springs, and Sheep Creeks. Douglas-fir beetle kill decreased noticeably over the rest of the Northern Region in 1975.

PINE ENGRAVER BEETLE, *Ips* spp. Infestations of these beetles decreased in northern Idaho and Montana since the drought of 1973 which triggered outbreaks. On the Lolo National Forest, Montana, mainly on State and private lands, small groups of killed ponderosa pines occurred along the Clark Fork River running northwest of Missoula to St. Regis. Other groups were concentrated north of Plains in Lunch, Buffalo Bill, and Weeksville Creeks. More than 660 ponderosa pine were killed within the above areas.

Almost all of the ponderosa pine stands along the east side of the Flathead Indian Reservation, Montana, contained *Ips* killed trees from Evaro to north of Polson. Other hot spots on the Reservation were west of Camas Prairie, northwest of Lonepine, Irving Creek, and northwest of Elmo. Total trees killed were over 1,800.

FIR ENGRAVER, *Scolytus ventralis* LeConte. Fir engraver beetle damage is widespread and heavy in grand fir stands over most of northern Idaho and western Montana. More than 1,630 grand fir were killed on the Fernan and Wallace Ranger Districts, Idaho Panhandle National Forests within the Coeur d'Alene River complex. On State and private lands southwest of Coeur d'Alene and south of Pinehurst, many groups were evident. Only 234 trees were infested from Bonners Ferry south to Athol and north to Priest Lake. Heavy group kills occurred along the St. Maries River, south to North Fork Clearwater River, and from Troy north to Coeur d'Alene Lake. An estimated 10,000 grand fir were attacked in these areas.

From the North Fork Clearwater River south to the Middle Fork Clearwater River, in excess of 15,500 trees were killed on State and private lands, and about 280 trees were killed on Forest Service land on the Clearwater National Forest, Idaho.

About 3,500 trees were attacked within the confines of the Nezperce National Forest, Idaho. Heaviest concentrations were from the Middle Fork Clearwater River south to the South Fork Clearwater River, south of Grangeville, west of Slate Creek, and northwest of Riggins.

An estimated 800 trees were killed from the east of Kalispell to the south of Goat Creek, Flathead National Forest, Montana. Only 115 trees were detected northeast of Polson and west of Hot Springs on the Flathead Indian Reservation, Montana.

Infested groups were scattered over the entire Kootenai National Forest, Montana. Some of the heaviest damage was on the Cabinet Ranger District. There were about 400 trees killed northwest and east of Troy and north and south of Libby, and along the Bull River more than 2,000 trees were killed.

Aerial surveys detected about 2,000 killed trees in concentrations along the Thompson River, northwest and west of Plains, north of St. Regis, and west of Thompson Falls, Lolo National Forest, Montana.

WESTERN PINE BEETLE, *Dendroctonus brevicomis* Lec. Aerial surveys of the Nezperce National Forest, Idaho, in 1975 showed more than normal numbers of trees killed. Groups of from one to five faders were widespread over the ponderosa pine type on the Clearwater, Slate Creek, and Red River Ranger Districts.

Other Insects

WESTERN FALSE HEMLOCK LOOPER, *Nepytia freemani* Munroe. Populations declined to endemic levels and no visible defoliation was detected in 1975.

ASH BORER, *Podosesia syringiae fraxini* (Lugger). This moth remains a serious threat to green ash shelterbelt plantings in North Dakota.

FOREST TENT CATERPILLAR, *Malacosoma disstria* Hbn. (Fig. 4). Defoliation occurred for the second year in *Populus* spp. along the Jocko River near Evaro, and along the Fisher River near Libby, Montana. Defoliation will probably continue in 1976.

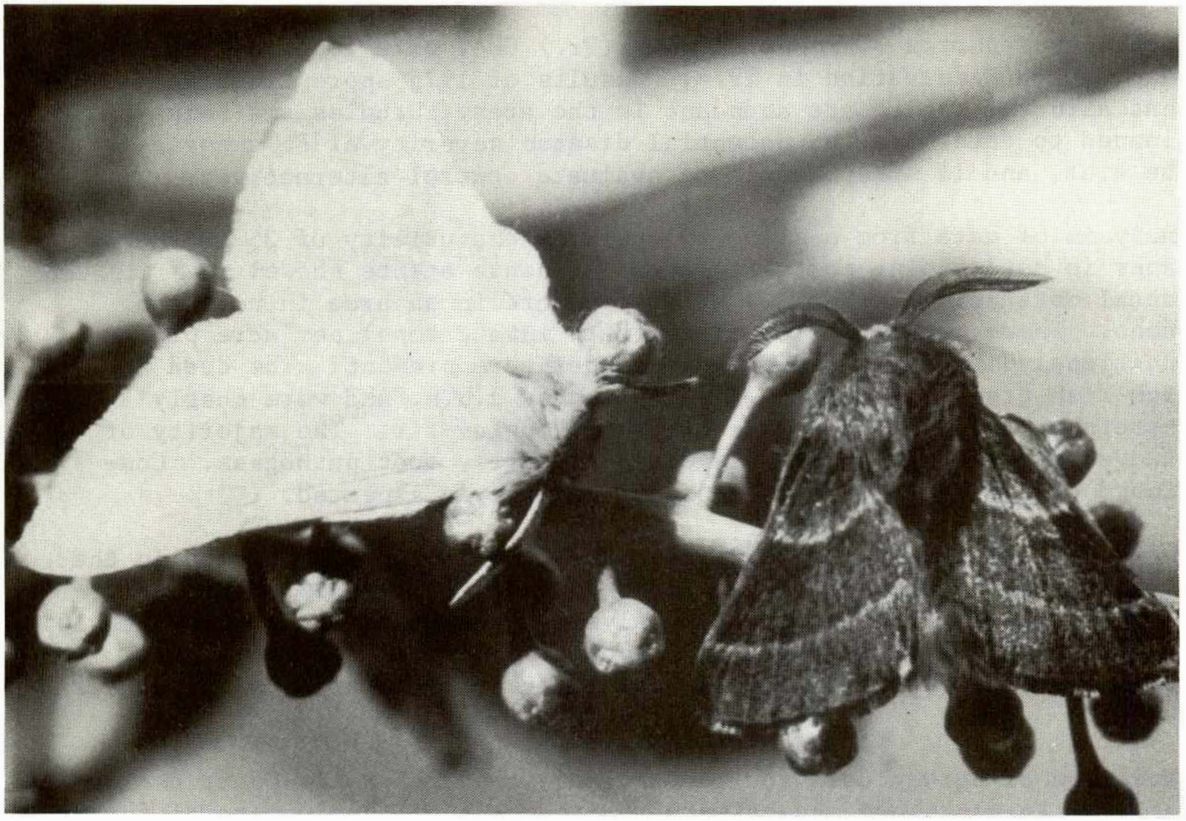


Figure 4.--Female (on left) and male forest tent caterpillar adults.

STATUS OF FOREST DISEASES

Conditions in Brief

Although airborne spores of *Fomes annosus* are abundant in one area in western Montana, mortality caused by this fungus is minimal. Based on expanded survey information, an estimated 5.1 percent of the Coeur d'Alene National Forest is included in root disease centers. No important decay fungi were found in trees top killed by insect defoliation 10 and 25 years ago. Mortality in 2-0 seedlings at the Coeur d'Alene Nursery was only 3 to 4 percent. Estimates of *Fusarium* populations in soils indicate soil fumigation at the nursery varied from effective in some beds to unnecessary and possibly detrimental in others. One additional case of Dutch elm disease was confirmed in Missoula, Montana. A single larva of the thicket hairstreak butterfly was found feeding on lodgepole pine dwarf mistletoe. Baseline conditions were characterized near a magnesium plant in northeastern Washington and a coal-fired power plant in southeastern Montana prior to their operation. Both facilities are now in operation; the studies are continuing to assess air pollution damage to trees and understory species near each plant.

Root Diseases

Mature sporophores of *Fomes annosus* (Fr.) Cke. were found on the Flathead Indian Reservation in 1974. Results of 1975 spore trapping show that airborne spores are abundant in the area. Studies are being planned to determine the potential disease severity of *F. annosus* in the area, and if substantial, to evaluate control alternatives.

Analysis of data from a study to evaluate the utility of 35 mm photography in determining mortality due to disease agents showed an estimated annual mortality rate of 1.5 trees per acre in an area in northern Idaho. There were 9.8 dead trees (with intact tops) per acre plus an additional 9.5 green high-risk trees per acre present. The dead and high-risk trees ranged from 5 to 15 inches d.b.h. and were mostly western white pine, lodgepole pine, or Douglas-fir. The majority of damage was caused by disease agents, primarily root pathogens. Continued or accelerated disease-caused decline is expected.

The field portion of a root disease survey of about 2,000 acres in the Pleasant Creek drainage on the Idaho Panhandle National Forests was completed in 1975. Preliminary analysis of the data shows that 8 to 10 percent of the area is covered by root disease centers. This may, however, be beneficial since the primary use of the area is elk winter range.

Expansion of survey data for root disease centers on the Coeur d'Alene National Forest shows an estimated 5.1 percent of the commercial forest area on that Forest is included in root disease centers. The greatest number of centers occurred in the western hemlock/pachistima habitat type while the highest frequency of centers occurred in the grand fir/pachistima and Douglas-fir/ninebark habitat types.

Stem Decay

A study to evaluate the association between insect defoliation and stem decay was initiated. Wood chips from trees that were top killed 10 and 25 years ago were cultured in the laboratory; no important decay fungi were isolated.

Nursery Diseases

Evaluations to determine seedling mortality at the Coeur d'Alene Nursery continued; losses in 2-0 stock are only 3 to 4 percent.

New mortality plots were established to evaluate the utility of large-scale color infrared photography in identifying areas having a high disease potential. These photos will also be used to assess the relationships between soil environmental conditions, soil microorganisms, and seedling vigor and mortality.

Preliminary evaluations of the response of selected soil fungi to seedbed fumigation with a methyl bromide/chloropicrin mixture were made using two soil-sampling methods--soil dilution and soil profile plate. Results indicate that fumigation may have been unnecessary in some beds, and that effectiveness varied from positive to negative in terms of *Fusarium* spp. populations.

Empirical observations at the St. Regis Paper Company nursery at Libby, Montana, indicate seedling losses vary from 40 to 100 percent in individual beds. Losses are caused by a number of probably interacting factors, including excessive herbicide usage, highly alkaline soil conditions, and improper use of organic materials, which have led to a buildup of root pathogens. Laboratory data shows soil *Fusarium* spp. populations of up to 1,600 propagules per gram of soil. *Pythium* spp. may also be present.

White Pine Blister Rust

The Clearwater National Forest established a natural selection western white pine seed production area in the Beech Creek drainage. Approximately 82 percent of the western white pine on the area had been killed by the white pine blister rust fungus, *Cronartium ribicola* J. C. Fisch. The surviving white pine carry a high frequency of genes for resistance to the fungus. All trees except the surviving white pine were removed and the ground scarified. White pine seedlings that become established should contain an even higher frequency of resistant genes than the parent trees. Once the white pine regeneration is established, the remaining overstory will be removed. These seedlings will eventually produce seed highly resistant to white pine blister rust and well adapted to that elevational zone.

Urban and Community Forestry

Dutch elm disease of American elm, caused by *Ceratocystis ulmi* (Buism.) C. Moreau, was confirmed for the first time in Montana in 1973 from a single tree. One additional tree was confirmed in 1975; several more trees with typical symptoms died but the fungus was not recovered.

Dwarf Mistletoe

Silvicultural control of dwarf mistletoe was accomplished on 5,068 acres on four National Forests in 1975. Control was accomplished in conjunction with normal timber management functions and all financing was from timber management funds.

A single larva of the thicket hairstreak butterfly, *Mitoura spinetorum* Hewitson, was found feeding on lodgepole pine dwarf mistletoe, *Arceuthobium americanum* Nutt. ex Engelm., in western Montana. This is our first larval collection, but is not a new record. The Montana Division of Forestry entomologist has collected adults from widespread locations throughout western Montana.

Air Pollution

The magnesium plant at Addy, Washington, is operational. Baseline ecological measurements and quantitative data on foliar insects, diseases, and SO_2 symptoms have been taken in the area. Fifty conifer foliage samples will be analyzed for total sulfur.

A 330-megawatt coal-fired steam power plant is operational at Colstrip, Montana. Strip mining and rail transportation of coal is in progress. A second 330-megawatt plant will soon go on-line. A cooperative agreement was set up between the University of Montana and the Forest Service to characterize baseline conditions of the ponderosa pine ecosystems on the Custer National Forest. Ponderosa pine is one of the more sensitive species to air pollution, and it is a major economic factor in the Colstrip area. Seventeen study plots were established in potentially high air pollution impact areas. Evaluations were made of physical, biological, and chemical characteristics on selected ponderosa pine. This long-term assessment will act as an early warning system for potential air pollution damage to the trees and understory species on the Custer National Forest.

Miscellaneous Diseases

The Kootenai National Forest reported top-killed western larch scattered over nearly 300 acres. Examination showed that damage was due to rodent girdling of the main stems in the upper crowns. An accurate estimate of damage could not be made due to fall needle drop, but District people estimate 10 to 12 trees per acre have been top killed.

Needle cast of lodgepole pine, caused by *Lophodermella concolor* (Dearn.) Darker, was prevalent this year in the lower Clark Fork River drainage in western Montana and northern Idaho. About 65,000 acres were aerially surveyed and accessible areas ground checked. Nearly 9,500 acres were identified with light discoloration, and 9,000 acres with heavy discoloration. *Lecanosticta* sp. and *Hypodermella arcuata* (Darker) Darker were locally severe on western white pine in the Bovill area of northern Idaho.

ACKNOWLEDGMENT

The entire staff of Forest Environmental Protection assisted in compiling this report. Other Federal, State, and private agencies helped in gathering information during some of our surveys.